

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: )  
Supratik Guha et al. )  
Serial No.: 10/699,399 )  
Group Art Unit: 2859 )  
Filed: October 30, 2003 )  
Examiner: Mirellys Jagan )  
For: TRANSPARENT COOLING DUCT )  
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)

APPEAL BRIEF

MS-APPEAL BRIEF-PATENTS  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Sir:

This Appeal Brief is filed in response to a Final Office Action dated December 4, 2006, followed by a Notice of Appeal with Pre-Appeal Conference Request Brief filed March 5, 2007, a Notice of Panel Decisions from Pre-Appeal Brief Review dated March 28, 2007 and a Notification of Non-Compliant Appeal Brief dated January 25, 2008. Reconsideration of the Application, withdrawal of the rejections, and allowance of the claims are respectfully requested.

**CERTIFICATE OF TRANSMISSION**

In accordance with 37 CFR 1.8, I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 or facsimile transmitted or submitted under electronics filing system to the U.S. Patent and Trademark Office on the date:

February 25, 2008

By: Jon Gibbons

Signature: /Jon Gibbons/  
(Applicant, Assignee, or Representative)

I. REAL PARTY IN INTEREST

The real party in interest is International Business Machines (IBM) of Armonk, NY.

II. RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences.

III. STATUS OF CLAIMS

Claims 1, 2, 8, 13, 14, 20, 24-28, 31 and 32 have been canceled.

Claims 11, 12 and 23 have been withdrawn.

Claims 3-7, 9, 10, 15-19, 21, 22, 29 and 30 have been rejected.

The Appellant is appealing the rejection of independent claims 7 and 19.

IV. STATUS OF AMENDMENTS

The Examiner issued a final rejection of claims 3-7, 9-10, 15-19, 21-22, and 29-30 in the Final Office Action of December 4, 2006. In response, Appellants filed a Notice of Appeal with Pre-Appeal Conference Request Brief on March 5, 2007. Appellants subsequently received a Notice of Panel Decisions from Pre-Appeal Brief Review on March 28, 2007.

V. SUMMARY OF THE CLAIMED SUBJECT MATTER

It should be noted that individual paragraphs in the text of the original application as filed were sequentially numbered beginning with 0001. Support for the claims under appeal is adequately provided in the specification and the drawings.

There are two (2) independent claims under appeal in this case, namely, claim 7: "A system for measuring thermal distributions of an electronic device during operation" and claim 19: "A method for detecting thermal characteristics of an electronic device during operation".

**Independent claim 7 claims the following subject matter.**

Claim 7. A system for measuring thermal distributions of an electronic device during operation, comprising:

A) a duct adapted to be coupled with an electronic device, wherein the electronic device forms one side of the duct; Summary at pages 3-4 (para 0008); FIG. 8, and the Specification at pages 16-17 (paras 0053-0057).

B) a coolant flowing through the duct so as to cool the electronic device; Summary at pages 3-4 (para 0008), FIG. 8, and the Specification at pages 16-17 (paras 0053-0057).

C) and, a photon detector located adjacent to the duct for detecting photons emitted from the electronic device, wherein the duct and the coolant are at least partially transparent to photons with wavelengths above 3.6 microns and the duct is made of at least one of polished silicon, quartz, sapphire, glass, and diamond. Summary at page 4 (para 0009), FIG 8, and the Specification at pages 16-17 (paras 0053-0057).

**Independent claim 19 claims the following subject matter.**

Claim 19. A method for detecting thermal characteristics of an electronic device during operation, comprising:

A) detecting, by a photon-detector, photons from an electronic device during operation of the electronic device, the photons indicative of thermal characteristics of the electronic device, the photon detector located adjacent to a duct that is adjacent to the electronic device, wherein the electronic device forms one side of the duct and a coolant flows through the duct so as to cool the electronic device and the duct and the coolant are at least partially transparent to photons with wavelengths above 3.6 microns and the duct is made of at least one of polished silicon, quartz, sapphire, glass and diamond. Summary at page 4 (para 0009), FIG 8, and the Specification at pages 16-17 (paras 0053-0057).

## VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Whether claims 4, 7 and 29 are anticipated under 35 U.S.C. §102(b) as being anticipated by *Davidson* (US 6,140,141) and whether claims 3, 9, and 10 and claims 15, 16, 19-22 and 30 are unpatentable over *Davidson* (US 6,140,141) in view of *Paniccia* (US 6,251,706), 35 U.S.C. §103(a).

## VII. ARGUMENT

Appellant's independent system claim 7 recites, *inter alia*:

7. A system for measuring thermal distributions of an electronic device during operation, comprising:

a duct adapted to be coupled with an electronic device, wherein the electronic device forms one side of the duct;

a coolant flowing through the duct so as to cool the electronic device; and,

a photon detector located adjacent to the duct for detecting photons emitted from the electronic device, wherein the duct and the coolant are at least partially transparent to photons with wavelengths **above 3.6 microns** and the duct is made of **at least one of polished silicon, quartz, sapphire, glass, and diamond**. [emphasis added]

Appellant's independent method claim 19 recites, *inter alia*:

19. A method for detecting thermal characteristics of an electronic device during operation, comprising:

detecting, by a photon-detector, photons from an electronic device during operation of the electronic device, the photons indicative of thermal characteristics of the electronic device, the photon detector located adjacent to a duct that is adjacent to the electronic device, wherein the electronic device forms one side of the duct and a coolant flows through the duct so as to cool the electronic device and the duct and the coolant are at least partially

transparent to photons with wavelengths **above 3.6 microns** and the duct is made of **at least one of polished silicon, quartz, sapphire, glass and diamond**. [ emphasis added ]

Appellant respectfully asserts that Appellant's invention is not anticipated under 35 U.S.C. §102(b) as being anticipated by *Davidson* and the Appellant's invention is not obvious under 35 U.S.C. §103(a) and therefore is patentable over *Davidson* in view of *Paniccia* for the following reasons.

Briefly, Appellant's invention is a device for measuring thermal distributions on a chip. The device includes a duct located above, and coupled to, an electronic device. The duct has an at least partially transparent upper wall that is made of polished silicon, quartz, sapphire, glass, or diamond and uses an upper surface of the electronic device as its bottom wall. Within the duct is a transparent fluid that flows over the top surface of the electronic device to cool the device. (See, paras. 0053 and 0056, and FIG. 8). A photon detector is located above the chip and measures infrared radiation emitted by the chip to calculate a thermal distribution of heat on the chip. For proper measurement of a thermal distribution, the photon detector must see through the upper surface of the duct and fluid to the back surface of the chip throughout the entire infrared frequency range. The infrared frequency range includes wavelengths between 2.6 microns to 20 microns. The materials (the duct and the coolant) were selected because these were at least partially transparent to photons with wavelengths above 3.6 microns. Since few materials are transparent at these wavelengths, Appellant claimed the use of polished silicon, quartz, sapphire, glass, and diamond, because these materials are transparent to frequencies having wavelengths above 3.6 microns.

*Davidson* discloses a system comprising a duct adapted to be coupled with an electronic device, wherein the duct forms one side of the duct; a coolant flowing through the duct so as to cool the electronic device; and a photon detector (radiation detector 145) located adjacent to the duct for detecting photons emitted from the electronic device; wherein the duct and coolant are at least partially transparent to photons with

wavelengths between about 0.1 micron to 20 microns (1 micron); the coolant is either water or a perflourocarbon; the duct comprises a window of quartz or glass; and the device includes a protecting outer layer (is packaged) (see Figs 2 and 3; col 2, line 30 – col 3, line 2; and col 3, lines 39-49). On page 3 of the Office Action dated Dec. 4, 2006, the Examiner states “Davidson does not disclose the duct being made of at least one of polished silicon, quartz, sapphire, glass, and diamond; ...”.

*Paniccia* discloses a system for testing an electronic device during operation by detecting photons (IR radiation) from the device through an IR-transparent window made of diamond, silicon or sapphire that is couple to the device. The material of the window is thermally conductive, and is chosen depending on the heat removal requirements of the device (see col 5, lines 51-65). A photon detector comprising an IR camera is located adjacent the device to detect the photons emitted by the device for use by its processor in generating a thermal map of the device, the camera capturing thermal information from the device during operation of the device under conditions for which the device is designed. *Paniccia* discloses that it is known in the art to determine the voltage levels of the device as well as thermal information of the device by detecting photon emissions from the device when testing the device at its operation capacity, and that the IR camera can determine the voltage levels of the device as well as thermal information. The thermal information allowing proper thermal regulation of the device to prevent thermal degradation (see Fig 7D, col 1, line 66 – col 2, line 9; col 2, lines 26-35 and 43-55; and col 7, lines 13-37).

The United States Supreme Court recently issued an opinion regarding the issue of obviousness under 35 USC §103(a) when the claim recites a combination of elements of the prior art. See KSR Int'l Co. v. Teleflex, Inc. No. 04-1350 (U.S. Apr. 30, 2007)<sup>1</sup>.

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<sup>1</sup> See, <http://www.supremecourtus.gov/opinions/06pdf/04-1350.pdf>

In *KSR Int'l*, the Court reaffirmed the *Graham*<sup>2</sup> factors in determining obviousness under 35 U.S.C §103(a). The four factual inquiries under *Graham* are:

- 1) determining the scope and contents of the prior art;
- 2) ascertaining the differences between the prior art and the claims in issue;
- 3) resolving the level of ordinary skill in the pertinent art; and
- 4) evaluating evidence of secondary consideration.

The Supreme Court did not totally reject the use of "teaching, suggestion, or motivation" as a factor in the obviousness analysis. Rather, the Court recognized that a showing of "teaching, suggestion, or motivation" to combine the prior art to meet the claimed subject matter could provide a helpful insight in determining whether the claimed subject matter is obvious under 35 USC §103(a). The Court rejected a rigid application of the "teaching, suggestion, or motivation" test which required a showing of some teaching, suggestion, or motivation in the prior art that would lead one of ordinary skill in the art to combine the prior art elements in the manner claimed in the application or patent before holding the claimed subject matter to be obvious. The Court noted that the analysis supporting a rejection under 35 USC §103(a) should be made explicit and that it was important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the prior art elements in the manner claimed. The Court stated:

Often, it will be necessary ... to look to interrelated teachings of multiple patents; the effects of demands known to the design community or present in the marketplace; and the background knowledge possessed by a person having ordinary skill in the art, all in order to determine whether there was **an apparent reason** to combine the known elements in the fashion claimed by the patent at issue. To facilitate review, this analysis **should be made explicit.** (emphasis added)

*KSR Int'l*, slip op. at 14 (emphasis added).

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<sup>2</sup>

Graham v. John Deere, 383 U.S. 1, 17-18, 148 USPQ 459, 467 (1966)

Thus, in formulating an obviousness rejection under 35 USC §103(a) based upon a combination of prior art elements, it remains necessary to identify the reason why a person of ordinary skill in the art would have combined the prior art elements in the manner claimed.

The Examiner's reason, as stated on page 4 of the December 4, 2007 Final Office Action, is given as: *"By replacing the window with a window as taught by Paniccia, in order to provide a window having a desired thermal conductivity to remove heat depending on the heat removal requirements of a particular application, and since the particular type of material used to make the window is only considered to be the use of a "preferred" or "optimum" material out of a plurality of well known materials that a person having ordinary skill in the art at the time the invention was made would have been able to provide based on intended use of applicant's apparatus, i.e., suitability for the intended use of applicant's apparatus, which in this case is to provide a window that is partially transparent to photons with wavelengths above 3.6 microns, as taught by Davidson and Panicking."*

The Examiner asserts that a selection of a material on the basis of suitability for intended use of an apparatus would be entirely obvious. *In re Leshin*, 125 USPQ 416 (CCPA 1960).

Appellant respectfully asserts that there is no teaching, suggestion, or motivation to combine these references.

*Davidson* is not directed towards a device for measuring thermal distributions of chips but for sensing voltages of signals on a die. (*Davidson*, col. 3, lines 41-42) In *Davidson*, the voltages are not measured by sensing infrared radiation but by sensing a polarization of light reflected back from the device (Col. 1, lines 25-29) or by measuring the intensity of near-infrared radiation (Col. 2, lines 58-60) emitted from the circuit. Near-infrared radiation has a defined range of wavelengths between 0.75 and 2.5 microns. *Davidson* discloses two materials that are used for the window: fused quartz,

and BK-7 glass. (*Davidson*, col. 3, lines 1-2).

*Paniccia* discloses a window material that is transparent to IR wavelengths, *Paniccia* does not teach nor suggest the window being part of a cooling system that uses coolant flowing through a duct so as to cool an electronic device.

*Davidson* does not operate in the IR frequency range. (*Davidson*, col. 2, line 59). The two materials specifically called out by *Davidson*, namely fused quartz and BK-7 glass, are sufficient for the near-infrared radiation range that *Davidson* operates in. (*Davidson*, col. 4, lines 1 and 2). Thus, one would have no motivation to take the IR transparent window material from *Paniccia*, a reference that does not even pertain to liquid cooling, and exchange it for the upper window of a cooling duct in *Davidson*. In addition, *Davidson* is not concerned with generating a thermal distribution. In *Davidson*, the voltages are not measured by sensing infrared radiation, but by sensing a polarization of light reflected back from the device (Col. 1, lines 25-29) or by measuring the intensity of near-infrared radiation (Col. 2, lines 58-60) emitted from the circuit.

*Davidson* does not disclose a duct that is at least partially transparent to photons with wavelengths above 3.6 microns and made of at least one of polished silicon, quartz, sapphire, glass, and diamond.

In addition, *Paniccia* doesn't have, teach, or suggest a duct with coolant flowing through it, as recited in the independent claims of the instant application. Therefore, one of ordinary skill would not be motivated to combine *Paniccia* with *Davidson*.

Further, when there is no suggestion or teaching in the prior art, the suggestion or motivation can not come from the Applicant's specification. The Federal Circuit has warned against using the Applicant's disclosure as a blueprint to reconstruct the claimed invention out of isolated teachings of the prior art. See MPEP §2143 and Grain Processing Corp. v. American Maize-Products, 840 F.2d 902, 907, 5 USPQ2d 1788 1792 (Fed. Cir. 1988) and In re Fitch, 972 F.2d 160, 12 USPQ2d 1780, 1783-84 (Fed.

Cir. 1992).

The prior art reference *Davidson* taken alone and/or in view of *Paniccia* does not suggest, teach or mention "a duct adapted to be coupled with an electronic device, wherein the electronic device forms one side of the duct; a coolant flowing through the duct so as to cool the electronic device; and a photon detector located adjacent to the duct for detecting photons emitted from the electronic device, wherein the duct and the coolant are at least partially transparent to photons with wavelengths above 3.6 microns and the duct is made of at least one of polished silicon, quartz, sapphire, glass, and diamond," as recited in independent claim 7 of the instant application. The prior art reference *Davidson* taken alone and/or in view of *Paniccia* also does not suggest, teach or mention "detecting, by a photon-detector, photons from an electronic device during operation of the electronic device, the photons indicative of thermal characteristics of the electronic device, the photon detector located adjacent to a duct that is adjacent to the electronic device, wherein the electronic device forms one side of the duct and a coolant flows through the duct so as to cool the electronic device and the duct and the coolant are at least partially transparent to photons with wavelengths above 3.6 microns and the duct is made of at least one of polished silicon, quartz, sapphire, glass and diamond," as recited

*Paniccia* taken alone and/or in view of *Davidson* does not suggest, teach or mention a duct partially transparent to photons with wavelengths above 3.6 microns and made of at least one of polished silicon, quartz, sapphire, glass and diamond.

Even if there was a motivation to combine the references, it is well established that references that teach away (produce an inoperable result) cannot serve to create a *prima facie* case of obviousness. See, *McGinley v. Franklin Sports, Inc.*, 262 F.3d 1339, 60 USPQ2d 1001 (Fed Cir 2001). See also, *In re Gurley*, 27 F.3d 551, 553, 31 USPQ2d 1131, 1132 (Fed. Cir. 1994). If references taken in combination would produce a "seemingly inoperative device," such references teach away from the combination and thus cannot serve as predicates for a *prima facie* case of obviousness.

In re Sponnoble, 405 F.2d 578, 587, 160 USPQ 237, 244 (CCPA 1969) (references teach away from combination if combination produces seemingly inoperative device); see also In re Gordon, 733 F.2d 900, 902, 221 USPQ 1125, 1127 (Fed. Cir. 1984) (inoperative modification teaches away).

On page 2 of the June 26, 2006 Office Action, the Examiner states "fused quartz (up to 3.6 microns) or BK7 glass (0.25 to 2.9 microns)" and this is clearly the range claimed in independent claims 1 and 17 of "wavelengths above 3.6 microns". By the Examiner's own admission, fused quartz and BK-7 glass are inoperable for the thermal imaging of Appellant's invention above 3.6 microns. In other words, if one were to take the glass of *Paniccia* and replace it with the glass of *Davison*, the IR detector of *Paniccia* would no longer function because IR wavelengths cannot pass through fused quartz or BK-7 glass. **During the prosecution history of this case, Appellant amended the independent claims on appeal specifically to include the "above 3.6 microns" limitation because the Examiner indicated that Davidson was inoperable at this level. See page 2 of Office Action dated June 26, 2006.** What is the motivation to combine these two references if the result to one skilled in this art is readily inoperable?

Appellant submitted a Declaration under 37 C.F.R. §1.132 from Dr. Emanuel Tutue, a researcher at IBM who is familiar with infra-red radiation along with the corresponding general wavelength of transmission of two groups of materials: i) fused quartz and B-K glass and ii) polished silicon, quartz, sapphire, glass and diamond. The Declaration of Dr. Tutue supports Appellant's argument that fused quartz and BK-7 glass are inoperable for thermal imaging above 4 microns. Appellant also has included herewith printouts of three (3) websites providing data on wavelength transmissions through BK7 glass and fused quartz.

Since *Davison* and *Paniccia* produce a clearly inoperable result, one would not be motivated to take the IR transparent window of *Paniccia* and place it in the liquid cooling duct of *Davison* because the materials recited in *Davison* for sensing

polarization of light work well for their intended use, which is at lower wavelengths. Further, one would not be motivated to take the IR camera of *Paniccia* and use it to replace the polarization sensing device of *Davidson*, simply because *Davidson* would no longer be able to sense voltages through detection of light polarization. Thus, *Davidson* would be inoperable. References that produce seemingly inoperative devices cannot serve as predicates for a *prima facie* case of obviousness.

Accordingly, Appellant respectfully asserts that it was improper to combine *Davidson* in view of *Paniccia* to reject Appellant's application under 35 U.S.C. 103(a). Accordingly, Appellant respectfully requests that the rejection be withdrawn and the Examiner's decision reversed.

VIII. CONCLUSION

For the reasons stated above, the Appellant respectfully contends that each claim is patentable. Therefore, reversal of all rejections is courteously solicited.

Respectfully submitted,

Dated: February 25, 2008

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## VIII. CLAIMS APPENDIX

Claim 1. (canceled)

Claim 2. (canceled)

Claim 3. The system of claim 7, further comprising:

a processor coupled to the photon detector for generating a thermal distribution of the electronic device based on information received from the photon detector.

Claim 4. The system of claim 7, wherein the coolant comprises any one of water and a cold gas.

Claim 5. The system of claim 7, wherein the coolant comprises at least one of any alkanes and perfluoroalkanes.

Claim 6. The system of claim 7, wherein the coolant is a non-polar liquid comprising any one of perflouro-octane, perfluro-hexane, octane, hexane and carbon tetrachloride.

Claim 7. A system for measuring thermal distributions of an electronic device during operation, comprising:

a duct adapted to be coupled with an electronic device, wherein the electronic device forms one side of the duct;

a coolant flowing through the duct so as to cool the electronic device; and

a photon detector located adjacent to the duct for detecting photons emitted from the electronic device, wherein the duct and the coolant are at least partially transparent to photons with wavelengths above 3.6 microns and the duct is made of at least one of polished silicon, quartz, sapphire, glass, and diamond.

Claim 8. (canceled)

Claim 9. The system of claim 7, wherein the photon detector captures thermal information from the electronic device during operation of the electronic device, wherein the electronic device is operating under conditions for which the electronic device is designed.

Claim 10. The system of claim 7, wherein the photon detector is an infrared camera.

Claim 11. (withdrawn).

Claim 12. (withdrawn).

Claim 13. (canceled)

Claim 14. (canceled)

Claim 15. The method of claim 19, further comprising:

generating a thermal distribution of the electronic device based on information received from the photon detector.

Claim 16. The method of claim 19, wherein the coolant comprises any one of water and a cold gas.

Claim 17. The method of claim 19, wherein the coolant comprises at least one of any alkanes and perfluoroalkanes.

Claim 18. The method of claim 19, wherein the coolant is a non-polar liquid comprising any one of perflouro-octane, perfluoro-hexane, octane, hexane, and carbon tetrachloride.

Claim 19. A method for detecting thermal characteristics of an electronic device during operation, the method comprising:

detecting, by a photon-detector, photons from an electronic device during operation of the electronic device, the photons indicative of thermal characteristics of the electronic device, the photon detector located adjacent to a duct that is adjacent to the electronic device, wherein the electronic device forms one side of the duct and a coolant flows through the duct so as to cool the electronic device and the duct and the coolant are at least partially transparent to photons with wavelengths above 3.6 microns and the duct is made of at least one of polished silicon, quartz, sapphire, glass and diamond.

Claim 20. (canceled)

Claim 21. The method of claim 19, wherein the photon detector captures thermal information from the electronic device during operation of the electronic device, wherein the electronic device is operating under conditions for which the electronic device is designed.

Claim 22. The method of claim 19, wherein the photon detector is an infrared camera.

Claim 23. (withdrawn).

Claim 24. (canceled)

Claim 25. (canceled)

Claim 26. (canceled)

Claim 27. (canceled)

Claim 28. (canceled)

Claim 29. The system of claim 7, wherein the electronic device includes a protecting

outer layer.

Claim 30. The method of claim 19, wherein the electronic device includes a protecting outer layer.

Claim 31. (canceled)

Claim 32. (canceled)

## IX. EVIDENCE APPENDIX

1) Declaration under 37 C.F.R. §1.132 from Dr. Emanuel Tutue

2) Printouts of:

<http://www.harrickscli.com/infoserver/Optical%20Materials/BK-7%20Glass.cfm>

[http://www.mellesgriot.com/products/optics/mp\\_3\\_1.htm](http://www.mellesgriot.com/products/optics/mp_3_1.htm)

[http://www.mellesgriot.com/products/optics/mp\\_3\\_2.htm.](http://www.mellesgriot.com/products/optics/mp_3_2.htm)

X. RELATED PROCEEDINGS APPENDIX

NONE